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REVIEW ARTICLE

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History and services of culture collections

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Abstract Microbial culture collections aim at collecting, maintaining and distributing microbial strains among microbiologists, and are considered to be a means to preserve microbial diversity ex situ. This article reviews the early history of culture collections, which were first set up in the late nineteenth century, with the introduction of pure culture techniques. It also describes the international connections between culture collections, which led to the foundation of the World Federation for Culture Collections (WFCC) and the International Congress of Culture Collections (ICCC). An overview of the Spanish Type Culture Collection (CECT) is included, as well as a description of the services that culture collections can offer.

Keywords Culture collection · Spanish Type Culture Collection · CECT · Frantisek Král

Introduction

Culture collections are services dedicated to supporting a wide variety of microbiological work. Their primary function is to collect, maintain and distribute microbial strains ordered by microbiological laboratories for use in teaching, researching, quality control assays, biotechnology, etc. Culture collections are like libraries, but instead of books they store living material, i.e. microorganisms. Usually, culture collections are considered to be a means to preserve microbial diversity ex situ. They originated when Koch's school introduced pure culture techniques in bacteriology, and the first culture collection to provide services was established by Prof. Král, in 1890, at the German University of Prague (Czech Republic) [4]. Frantisek Král (1846–1911) worked for about 30 years for the glass manufacturing firm Venceslaw Batka; afterwards, he was employed as a technician by the Institute of Hygiene of the German University of Prague. His experience with manufacturing laboratory glass products was the reason he was subsequently chosen by Prof. Soyka as curator of the bacterial collection. Later, because of his experience isolating, cultivating and maintaining microorganisms, he was appointed associate Professor of Bacteriology. In 1900, Král published the first catalogue of strains from a culture collection. After Král's death in 1911, the collection was transferred to the State Serum Institute in Vienna, whose director was Prof. Ernst Pribram. In 1927, Pribram joined Loyola University in Chicago, Illinois, and he took with him part of the Král's collection. Unfortunately, the part of the collection that remained in Vienna was destroyed during World War II.

After Král's collection, other culture collections were established. Currently, the oldest working collections are the Mycothèque de l'Universitée Catholique de Louvain (MUCL), in Louvain-la-Neuve, Belgium, which was set up in 1894, and the Collection of the Centraalbureau voor Schimmelcultures (CBS), in Utrecht, the Netherlands, founded in 1906. Since then, many other collections have been established. Some of them are for general purposes, some are specialized in certain kinds of microorganisms, and others are oriented to offering general services. In 1925, the well-known American Type Culture Collection (ATCC) was created in Washington, and it is now located in Manassas, Virginia.

International connections

International connections between culture collections started in 1946, when Prof. P. Hauduroy established a centralized information facility at the University of Lausanne, Switzerland, where information about the strains maintained in different collections was provided

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and an information bulletin was published. The Lausanne center became associated with the International Association of Microbiological Societies (IAMS, now named the International Union of Microbiological Societies, IUMS) and, in cooperation with it, an International Federation of Type Cultures was formed in order to repair the damage culture collections suffered during World War II.

In 1962, a Conference of Culture Collections was held in Ottawa (Canada), and the IAMS was asked to form a Section on Culture Collections, which was set up in 1963. The chairman of this section was Prof. Skerman (Australia); other members of the steering committee were Krasilnikow (Russia), Asai (Japan), van Beverwijk (The Netherlands), Martin (Canada), Donovick (USA) and Steel (UK).

When the IAMS was reorganized in 1970, this section became the World Federation of Culture Collections (WFCC), which has been active since then. In the World Data Center of Microorganisms (WDCM), now in Mishima, Japan, the WFCC has collected and stored information on several hundreds of collections throughout the world [7]. The WFCC consists of several committees and organizes the International Congress of Culture Collections (ICCC) every four years. In 1981, ICCC IV was held in Europe for the first time, and several European curators attending the meeting decided to form the European Culture Collection Organization (ECCO), whose first meeting took place in Göttingen, Germany, in 1982. In 1991, the tenth ECCO meeting, organized by the Spanish Type Culture Collection (CECT), was held in Valencia, Spain. Full information on culture collections can be found in Kirsop et al. [2].

The Spanish Type Culture Collection (CECT)

The Spanish Type Culture Collection (CECT, Colección Española de Cultivos Tipo) was founded by Prof. Julio R. Villanueva, who started to collect and maintain microbiological strains in 1960. For seven years, the CECT was located in what is now the Biological Research Center (CIB) of the Spanish Research Council (CSIC), in Madrid, Spain. In 1967, the CECT moved with Prof. Villanueva to the University of Salamanca and was housed in the Department of Microbiology of the Faculty of Biology. In 1974, the microbial strains of the CECT were transferred to the Department of Microbiology at the University of the Basque Country, in Lejona, Vizcaya, and Prof. Federico Uruburu became its new director. The first CECT strains catalogue was published on 1976. Later, in 1980, the CECT moved again, this time to its current location in Valencia, and became a service of the University of Valencia. In 1985, 1990 and 1998, successive editions of the CECT strain catalogue were published (Fig. 1). During its history, three collections of microorganisms have been transferred to the CECT: the Microbial Collection of Yeast Cultures (MCYC) of the Agronomical School of Madrid, the endosymbiotic nitrogen-fixing bacterial strains (MCRC) of the Agronomical School of Madrid, and the Yeast Collection of the Institute for Industrial Fermentations (IFI-CSIC) in Madrid.

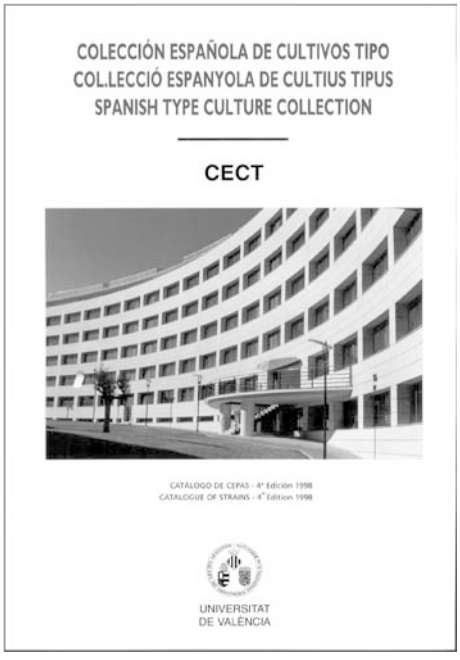

Fig. 1 The Spanish Type Culture Collection's 1998 catalogue

The CECT joined the WFCC in 1977 and it is listed as collection number 412 in the WDCM. In 1983 it joined ECCO and in 1992 was recognized as an International Depository Authority (IDA) under the Budapest Treaty for the deposit of microorganisms for patent purposes. The CECT is now housed in the Jeroni Muñoz Research Building of the University of Valencia, in Burjassot, very close to the city of Valencia. It has been an Affiliate Unit of the Agrochemistry and Food Technology Institute (IATA) of the Spanish Research Council (CSIC) since 1996. Furthermore, the CECT is also associated with the Spanish Society for Microbiology (SEM). More than 8,000 microbial strains, including bacteria, filamentous fungi and yeast, are currently maintained in the CECT. Many of the strains are of industrial importance, others are taxonomic type strains; some are used for assays, testing, teaching, biochemical and genetic research, while others are of general scientific interest.

Services of culture collections

Like other culture collections, CECT offers the following services to the microbiological community: (1) to collect, maintain, and dispatch microbial strains. Culture collections are specialized laboratories with extensive expertise in maintaining microbial strains and avoiding possible genetic changes that can take place

during this maintenance. This can be done by using the most suitable maintenance methods [1, 3, 5]. The microbial strains are dispatched according to the international postal, quarantine and safety regulations [6]. (2) To collect strain data and make them accessible to the microbiological research community through printed or on-line catalogues. (3) To act as safety deposits of microbial strains with restricted distribution. (4) To provide identification services according to the expertise of the culture collection regarding the different kinds of microorganisms. (5) To serve as deposits of strains. These can be public strains, and thus published in the culture collection catalogue, or strains held for patent purposes under the Budapest Treaty; in this case the data are not published in the catalogues. There are also compulsory deposits in bacterial taxonomy every time a new species is described, the type strain being published in the catalogue. (6) To organize training courses, mainly related to the identification and maintenance of microorganisms. For example, the CECT organizes an annual 40-hour course on the ''Maintenance and characterization of microbial strains''. (7) To carry out research, related mainly to taxonomy and microbial preservation. (8) To provide general advice in the field of microbiology.

By preserving microbial strains, microbiological culture collections provide a link to the past; they make it possible to work with the same strains that were described or cited in publications. Moreover, culture collections also store newly described microorganisms, which researchers can test for future biotechnological applications.

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